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FOREST PLANTING LEAFLET.

WHITE OAK (Quercus alba).

FORM AND SIZE.

White oak, when grown in the forest, is characterized by a long, clean trunk of rather uniform diameter, surmounted by a comparatively small crown. In the open the crown becomes rounded and massive, much greater in breadth than in height, supported by a short, sturdy trunk. Under average conditions the tree grows to a height of from 60 to 100 feet, with a diameter of from 2 to 4 feet. In the Southern Appalachians specimens much exceeding these dimensions are often found. Near the western limits of its range the tree is smaller.

RANGE.

White oak is common in the eastern United States; a line marking the general boundary of its range would extend from southern Maine and the valley of the St. Lawrence westward through Ontario, Michigan, and Wisconsin to central Minnesota; thence south through eastern Nebraska and Kansas to Texas; and east to Florida through the intervening Gulf States. The region of best development is on the lower slopes of the Alleghenies and in the valley of the Ohio and its tributaries.

The white oak forms pure forests and is also found in mixture with other hardwoods, such as chestnut, elm, basswood, hickory, maple, black walnut, yellow poplar, red oak, yellow oak, scarlet oak, post oak, and chestnut oak.

Artificial propagation may be carried on throughout its entire range.

HABITS AND GROWTH.

White oak does not demand rich soil, but can maintain itself fairly well except on cold, wet land with an impenetrable subsoil. It reaches its best development, however, on rich, moist, well-drained loam, or clay loam, and prefers protected situations. Bottomlands and sheltered coves offer the ideal conditions. It is a fairly hardy species and resists both drought and cold, although somewhat susceptible to very low temperature. The young trees are liable to damage from wind.

For thrifty growth white oak needs plenty of light, although it will exist in partial shade. Young seedlings are tolerant and will start under dense shade, but they will not live long unless light is admitted.

In early life white oak is not so vigorous as red oak. Growth is slow but persistent, and trees attain great age. Forest-grown white oak requires an average of ten years for every inch of diameter increment, and this rate of growth often remains uniform until the tree is more than one hundred years old. The average annual height growth during such a period is about 8 inches. Under the more favorable conditions that usually prevail in a planted forest the rate of growth would be somewhat higher.

ECONOMIC USES.

The wood of white oak ranks among the best in general usefulness and is superior to that of other species of oak. It is ashy gray in color and is strong, heavy, hard, tough, close-grained, and very durable. It shrinks considerably and checks badly unless carefully dried. This tendency is more marked in white oak than in other oaks. The wood is used extensively in shipbuilding, heavy construction work, tight cooperage, vehicle manufacture, farm implements, ties, posts, piling, and for furniture and interior finish, often in the form of veneers. So great is the economic value of this wood that the available supply is being rapidly exhausted.

Practically no measures have been taken for the propagation of white oak. This is chiefly because its growth is so slow that plantations would give a very low margin of profit. Natural reproduction should, however, be encouraged and protected. Sprout forests of white oak can be managed at small expense for the purpose of yielding ties and posts, and can be made profitable if near the market. For ornament the tree is very desirable because of its form and hardiness.

METHODS OF PROPAGATION.

White oak reproduces itself by seeds and sprouts. The young trees sprout freely from the stump, so that where ties, posts, or small

timbers are desired, the system of regeneration by sprouts is practicable. To insure sprouting, the stumps should be cut low and smooth.

Small edible acorns are borne in abundance by the white oak nearly every year and mature in September or October. Since the acorns germinate readily when they fall on fresh soil or beds of leaves, natural reproduction is usually abundant where the seed is not eaten by rodents.

In starting a plantation of white oak it usually is advisable to plant the acorns on the planting site, rather than to use nursery stock, because of the difficulty and expense involved in transplanting the seedlings.

Seed should be collected from middle-aged, vigorous trees only, since the seed from young trees does not produce strong healthy plants, and that from old trees is small and inferior. Acorns of the white oak germinate soon after they fall from the trees; therefore they should be gathered immediately and planted or stratified in sand before the developing sprouts are large enough to be injured by handling. Stored acorns lose some of their vitality, and therefore should be planted in the fall, except in localities where there are many squirrels. Squirrels and other rodents are very fond of white oak acorns because of their sweetness; often it will be necessary, where danger from squirrels threatens, to resort to spring planting. The acorns should be stored for the winter by stratifying in a box of moist sand, using 3 bushels of sand to 1 bushel of seed. In some cases it may even be advisable to grow seedlings in a nursery where protection can be assured. The acorns should be sown in the spring in a carefully prepared seed bed, spaced about 3 inches apart in drills and covered to a depth of 1 inch.

One pound of white oak seed contains about 100 acorns, and one bushel, about 9,000 acorns. A bushel of good seed will sow 2,000 linear feet of drill, and, if planted under favorable conditions, should produce 7,500 plants.

The root system of the white oak consists of a taproot, reenforced by numerous deep seated, lateral roots. During the seedling stage the root system develops rapidly, while the part above ground grows very slowly until the roots are well established. Root pruning is a necessary preliminary operation to transplanting.

PLANTING.

Fall planting of the acorns in the permanent site as soon as they mature is advisable for extensive operations. The seed may be sown broadcast on open land or abandoned fields and the cover given with a harrow. Broadcast sowing will require about 12 bushels of seed per

acre. A surer and much cheaper method is to plant the acorns in shallow furrows or in holes dug with a spade or grub hoe. Three or four acorns should be placed in each spot and covered not deeper than 1½ inches. The spacing of the seed spots should be 6 feet apart each way; if furrows are used, these may be plowed 8 feet apart and the acorns planted more closely in the furrows.

If the proposed planting site is on tillable land a crop of corn may be raised with the seedlings, thus utilizing the land more fully and providing cultivation that will be beneficial to the young oaks. In such planting, the ground should be prepared as for corn, marked out in check rows, and acorns planted alternately with the corn.

If nursery stock is to be planted instead of acorns, one-year-old seedlings should be used. These should be planted in the spring and should be spaced 6 feet apart each way.

White oak does well in pure stands, whether grown from sprouts or seed. On suitable soils, however, it may be planted in mixture with a number of other species, such as red oak, shagbark hickory, mockernut hickory, chestnut, yellow poplar, black walnut, white elm, white ash, and white pine.

CULTIVATION AND CARE.

Young plantations must be carefully protected from fire and stock. Cattle not only trample the seedlings but damage them by browsing. White oak plantations should, if possible, be cultivated for the first few years to prevent grass from crowding the seedlings and to lessen the danger from mice and rabbits if these should become troublesome. When crops are grown with the young oaks, cultivation may be continued for several years until the trees shade the ground; or, if the oaks have been planted sufficiently far apart, the intervening spaces may be planted after two or three years with seedlings of some shade-enduring species. These will form a lower story under the higher oak canopy and insure good forest cover.

In case of serious attacks by insects, specimens should be sent to the Bureau of Entomology of the Department of Agriculture for identification and advice as to methods of combating the insects.

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